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TITLE: Conveyor article-sorting system e.g. for airport passenger baggage or cargo handling - has primary and by-pass scanners, diverting bags for manual inspection to cross loop, diverting fraction for scanning which is then reintroduced into gaps in primary conveyor, also applies bar codes

INVENTOR: HATTON, G

PATENT-ASSIGNEE: MANNESMANN DEMATIC COLBY PTY LTD[MANS] , COLBY ENG PTY LTD[COLBN]

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ABSTRACTED-PUB-NO: AU 9715005A

BASIC-ABSTRACT:

The system (10) is a closed-loop conveyor (11) with multiple infeed locations
(1,2,3...n) and outfeed locations (A,B,C...X), corresponding to passenger
check-in locations and air-side handling areas of departure flights. Primary
scanner (15) interfaces with diverter (16). Suspect baggage is diverted to
manual loop (17).

The system includes a cross-loop or by-pass scanning section (20) interposed on
the primary conveyor which diverts a fraction of the infeed to a selection
portion of the outfeed locations for identification and sorting. The divided
fraction is preferably reintroduced into gaps on the primary conveyor.

USE/ADVANTAGE - Minimising problems of prior art. Multiple feed locations.
Enhanced capacity. Has some degree of redundancy.

CHOSEN-DRAWING: Dwg.1/1

TITLE-TERMS: CONVEYOR ARTICLE SORT SYSTEM AIRPORT PASSENGER BAGGAGE CARGO
HANDLE PRIMARY PASS SCAN DIVERT BAG MANUAL

INSPECT CROSS LOOP
DIVERT FRACTION SCAN REINTRODUCTION GAP PRIMARY
CONVEYOR APPLY BAR
CODE

DERWENT-CLASS: Q35 X25

EPI-CODES: X25-F01; X25-F06;

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ABSTRACT

A conveyorised article sortation system, for use for example as an airport passenger baggage or cargo handling system or the like, having multiple infeed locations and multiple outfeed locations, and including a cross-loop or by-pass scanning station interposed on the primary conveyor which diverts a fraction of the infeed to a selected portion of the outfeed locations for identification and/or sorting, and preferably re-introducing the divided fraction into gaps on the primary conveyor.

AUSTRALIA

Patents Act 1990

COMPLETE SPECIFICATION

FOR A STANDARD PATENT

ORIGINAL

Name of Applicant: Mannesmann Dematic Colby Pty Limited ~~COLBY ENGINEERING PTY. LIMITED~~

Actual Inventor: GERALD HATTON

Address for Service: H.R. HODGKINSON & CO.
Patent & Trade Mark Attorneys
Level 3, 20 Alfred Street
MILSONS POINT NSW 2061

Invention Title: CONVEYOR SORTING SYSTEM

Details of Associated Provisional Applications:
Nos: PN 8334

The following statement is a full description of this invention, including the best method of performing it known to us:

FIELD OF THE INVENTION

The invention pertains to conveyorised sorting systems and more particularly to a conveyorised sorting system with a cross-feed or by-pass supplied by primary sortation.

BACKGROUND OF THE INVENTION

In the example of an airport passenger baggage handling system, a conveyor such as closed loop conveyor carries passenger baggage from multiple check-in counters to multiple destinations. This is accomplished by assigning each piece of baggage a barcoded identification tag which is scanned while the bags are on the conveyor. When a piece of baggage reaches the correct destination, a pusher or diverter removes the baggage item from the primary conveyor that it is on and directs it to an outbound conveyor, spur or chute which leads to the ultimate destination. This destination is generally the air-side baggage handling area of a particular outbound flight. In other systems, the bags are handled on recirculating, tilting trays. A piece of baggage is removed from the primary conveyor by tilting the tray, at the appropriate time, thus diverting the bag to an appropriate spur, outbound conveyor or chute etc. One disadvantage of such a system is that once a bag is diverted, a gap or empty tray is created on the primary conveyor. This gap and the accumulation of such gaps limits the sorting capacity of the system as a whole.

OBJECTS AND BRIEF SUMMARY OF THE INVENTION

It is an object of the present invention to provide a conveyorised sorting system which goes at least some way towards overcoming or at least minimising the prior art problems or limitations outlined above.

It is an object of the invention to provide a conveyorised sorting system with multiple infeed locations, multiple outfeed locations and a means for by-pass scanning and sortation.

It is another object of the invention to provide a conveyorised sortation system with enhanced capacity relative to the prior art.

It is another object of the invention to provide a conveyorised sortation system with some degree of redundancy.

It is yet another object of the invention to provide a conveyorised sortation system with some degree of double checking.

It is also an object of the invention to provide a method for sorting baggage.

These and other objects of this invention will become more apparent from the following description and the drawing.

According to one aspect of the present invention there is provided a conveyorised article sortation system comprising a primary conveyor adapted to convey articles placed thereon along a predetermined path or circuit from one or more infeed locations to one or more of a plurality of outfeed locations, a by-pass scanning station interposed on the primary conveyor to divert a fraction of the articles on the primary conveyor to a selected portion or number of the outfeed locations, with the divided fraction preferably re-introduced into spaces between articles on the primary conveyor created by removal of articles via said one or more outfeed locations.

According to another aspect of the present invention there is provided a a conveyorised article sortation system comprising a primary conveyor adapted to convey articles placed thereon along a predetermined path or circuit from one or more infeed locations to one or more of a plurality of outfeed locations, a primary scanner to sequentially scan identification means on all articles carried on the primary conveyor, first diverter means interfaced with said primary scanner to divert selected articles to a predetermined portion of said outfeed locations, second diverter means interfaced with the primary scanner to divert any offset articles not successfully scanned or identified by the primary scanner to an

article identification zone, means to reintroduce articles from the identification zone to the primary conveyor, a secondary scanner to scan the identification means and third diverter means interfaced with the secondary scanner to divert selected articles so as to by-pass the primary scanner for reintroduction thereof to other locations on the primary conveyor, said other locations being spaces created between articles on the primary conveyor as a result of the removal of articles therefrom by said first or said second diverter means.

According to a further aspect of the present invention there is provided a method of sorting articles on a conveyorised article sortation system whilst conveying said articles along a predetermined path or circuit from one or more infeed locations to one or more of a plurality of outfeed locations, comprising applying distinguishing identification means to each article, scanning each article sequentially to identify each article as it is conveyed, diverting selected articles from said path or circuit to by-pass a portion of said path or circuit, reintroduction of the selected articles to predetermined or selected spaces along the path or circuit and removal of said articles from the path or circuit via predetermined said outfeed locations.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a schematic diagram of a conveyorised sortation system according to the teachings of the present invention.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS OF THE INVENTION

As shown in the example of Figure 1, a conveyorised sortation system 10 comprises a closed loop conveyor 11. In this example, a closed loop system has been depicted because it is generally illustrative but it will be understood that the teachings of the present invention are also applicable to open ended systems. The schematic of Figure 1 illustrates a primary conveyor around which there is arranged a number of infeed locations numbered 1, 2, 3, 4 ... n and a number of outfeeds or spurs, depicted as A, B, C, D ... x. In practice, the infeed locations 1, 2, 3, 4 ... n correspond to passenger baggage check-in locations and

the outfeed locations A, B, C, D ... x correspond with spurs etc. which lead to the air-side handling areas of appropriate departing flights. Typically, each of the bags is allocated a printed barcode label which identifies the bag to a specific departing flight and therefore to a specific one of the outfeed locations.

In conventional systems, all of the bags pass through a primary scanner 15 which interfaces with the diverters 16. Any piece of baggage which is not successfully scanned is diverted to a manual sort loop 17 where the unsuccessfully scanned baggage is manually sorted then re-introduced onto the primary conveyor. When a bag reaches the appropriate outfeed location A, B, C etc., it is removed from the primary conveyor by the appropriate diverter 16, 19.

It will be observed that using this method, removal by the first and subsequent diverters 16 creates a gap on the primary conveyor. This gap has the effect of reducing the rate at which bags can be sorted at downstream locations B through x. As the conveyor progresses towards the last location x, these gaps accumulate. The accumulation of gaps detracts from the sorting efficiency of the system as a whole.

The situation is remedied with the addition of one or more cross-loop or by-pass scanners 20. A by-pass 29 comprises a scanning station 20 which reads the barcoded (or other) labels affixed to the bags on the primary conveyor and diverts a fraction of bags supplied by infeed locations 1 through f. This fraction corresponds to those bags which are identified as having a destination corresponding to outfeed locations p through x. Bags which are identified as ultimately destined for outfeed locations A through p continue past the remainder of the infeed locations g through n. Gaps in the stream of baggage passing infeed locations g through n are filled by baggage introduced at infeed locations g through n. In this way, the stream of baggage passing the primary scanner 15 represents the maximum capacity of the primary conveyor at that point.

The bags which now travel on the primary conveyor through to the first of the outfeeds or spurs A represents a population of baggage comprising all baggage introduced from

locations g through n plus those bags introduced from infeed locations 1 through f which were ultimately destined for outfeed locations A through m.

This population of baggage is acted on by the appropriate diverters 16. The removal of baggage onto the outfeed locations A through m is now occurring at a higher than ordinary rate because at least some fraction of the baggage ultimately destined for outfeed location p through x has been sorted and diverted by the by-pass sorting location 20.

Gaps in the stream of moving baggage passing outfeed location m are filled by the operation of the cross-loop or by-pass diverter 18. This diverter, located at the end of the cross-loop 29, moves bags from the cross-loop on to the primary conveyor and into the gaps created by the diversion of baggage from outfeed locations A through m. In this example, outfeed location p is operating efficiently because there are effectively no gaps in the stream of baggage passing this location. Subsequent diverters 19 handle the diversion of baggage in the remaining gates through location x.

The operation of the by-pass scanning and sortation station 20 thus operates to increase the overall baggage handling capacity of the system, in part, by more directly moving selected baggage items to their ultimate destination. Further, the operation of the scanning station 20, the cross-loop 29 and the cross-loop diverter 18 operate to fill gaps in the primary converter downstream of location m and again increase the efficiency of the system as a whole. Further, the system inherently incorporates a certain degree of redundancy as in the event of a scanner failure, either of the scanning locations 15, 20 can be used on their own in place of the combination of both. Similarly the sorters 1-f and g-n also form redundant systems as do the spurs A-m and p-x with their associated diverters 16 and 19. Moreover, the overall error rate of the system is reduced because at least some bags, in particular those originating from infeed locations 1 through f are scanned twice, once by the cross-loop scanner 20 and then again by the primary scanner 15.

It will also be appreciated that while the present disclosure has been described with reference to one particular example in which only a single by-pass or cross-loop scanning

station 20 is utilised, two or more such stations and corresponding cross-loops etc. may be utilised to subdivide and divert the incoming baggage stream in the manner described above. The exact proportion of infeed locations before and after the scanning station 20 are not considered an essential aspect of the invention.

It will also be appreciated that while the present invention has been described with reference to a closed loop conveying system 11, the principles outlined with reference to the provision of a cross-loop scanner 20, cross-loop 29 and cross-loop diverter 18 are equally applicable to an open ended system. For example, a primary conveyor could easily terminate at any location after x. Any bags arriving at this terminal location could be handled manually, stored or re-introduced on to the primary conveyor etc. Thus, whether or not the system is a closed loop or open ended is not considered an essential aspect of the invention.

The principles of operation of the cross-loop scanning location 20, cross-loop 19 and cross-loop diverter 18 are also considered equally applicable to both belted conveyors and those conveyors which carry tilting trays or other forms of active or mobile sortation.

Although an exemplary embodiment of the present invention has been shown and described, it will be apparent to those having ordinary skill in the art that a number of changes, modifications and alterations to the invention described herein may be made, none of which depart from the spirit of the present invention. All such changes, modifications and alterations should therefore be seen as being within the scope of the present invention.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:-

1. A conveyorised article sortation system comprising a primary conveyor adapted to convey articles placed thereon along a predetermined path or circuit from one or more infeed locations to one or more of a plurality of outfeed locations, a by-pass scanning station interposed on the primary conveyor to divert a fraction of the articles on the primary conveyor to a selected portion of the outfeed locations, and means to reintroduce articles from the diverted fraction back onto the primary conveyor.

2. A conveyorised article sortation system as claimed in Claim 1, wherein articles from the diverted fraction are reintroduced onto the primary conveyor into spaces between articles on the primary conveyor created by removal of articles via said one or more outfeed locations.

3. A conveyorised article sortation system comprising a primary conveyor adapted to convey articles placed thereon along a predetermined path or circuit from one or more infeed locations to one or more of a plurality of outfeed locations, a primary scanner to sequentially scan identification means on all articles carried on the primary conveyor, first diverter means interfaced with said primary scanner to divert selected articles to a predetermined portion of said outfeed locations, second diverter means interfaced with the primary scanner to divert any offset articles not successfully scanned or identified by the primary scanner to an article identification zone, means to reintroduce articles from the identification zone to the primary conveyor, a secondary scanner to scan the identification means and third diverter means interfaced with the secondary scanner to divert selected articles so as to by-pass the primary scanner for reintroduction thereof to other locations on the primary conveyor, said other locations being spaces created between articles on the primary conveyor as a result of the removal of articles therefrom by said first or said second diverter means.

4. A conveyorised article sortation system as claimed in any one of Claims 1 - 3, wherein the primary conveyor is a closed loop conveyor.

5. A conveyorised article sortation system according to any one of Claims 1 - 4, in the form of an airport passenger baggage or cargo handling system.

6. A conveyorised article sortation system as claimed in any one of Claims 3 - 5, wherein the identification means for the articles comprises a printed bar-code label, and wherein said scanners include bar-code reader means.

7. A method of sorting articles on a conveyorised article sortation system whilst conveying said articles along a predetermined path or circuit from one or more infeed locations to one or more of a plurality of outfeed locations, comprising applying distinguishing identification means to each article, scanning each article sequentially to identify each article as it is conveyed, diverging selected articles from said path or circuit to by-pass a portion of said path or circuit, reintroduction of the selected articles to predetermined or selected spaces along the path or circuit and removal of said articles from the path or circuit via predetermined said outfeed locations.

8. A conveyorised article sortation system substantially as hereinbefore described and illustrated with reference to the drawing.

9. A method of sorting articles on a conveyorised article sortation system substantially as hereinbefore described and illustrated.

Dated this 31st day of July 2000.

COLBY ENGINEERING PTY LIMITED

By:

HODGKINSON OLD McINNES
Patent Attorneys for the Applicant

15005/97

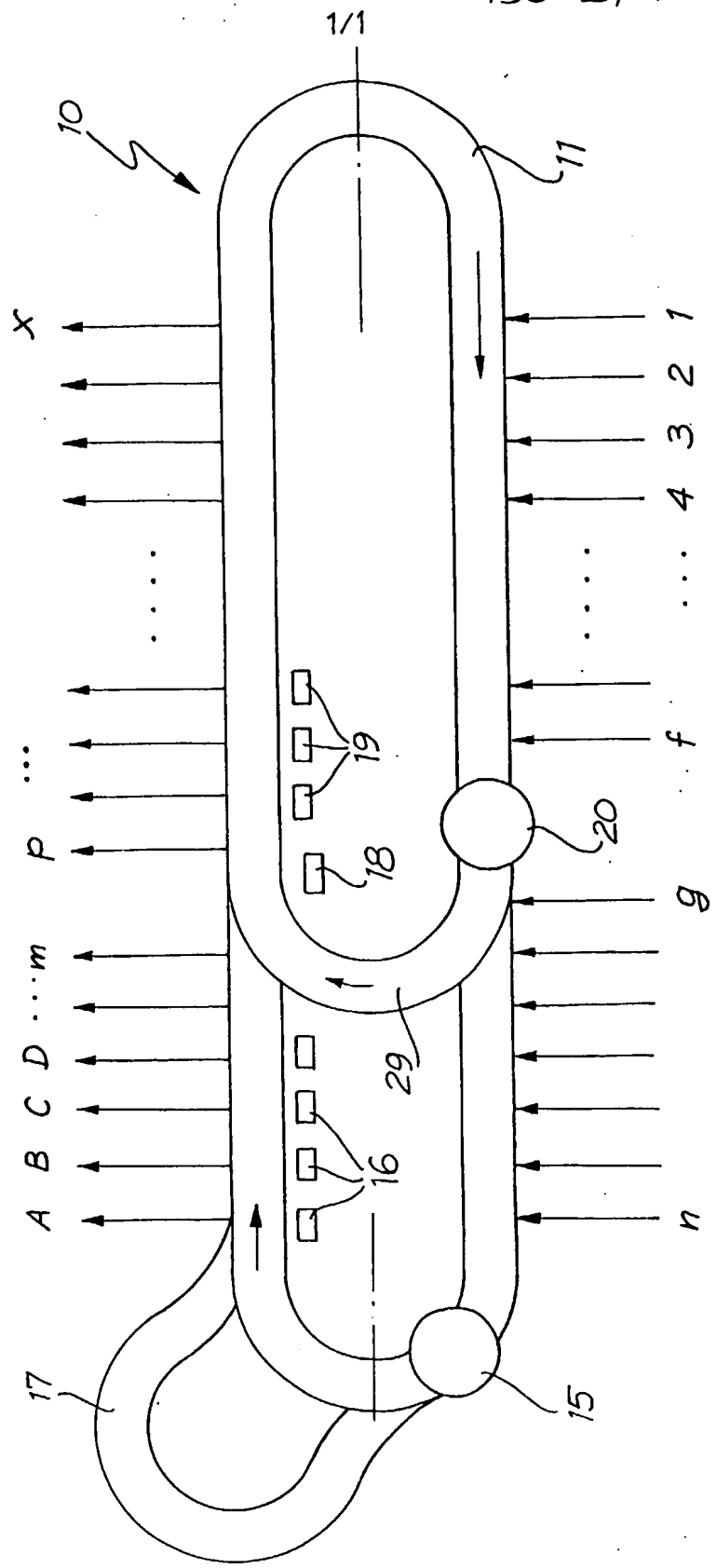

FIG. 1